Sum of torques equals rotational moment of inertia times angular acceleration. τ_m is the motor torque in N-m, I is the rotational moment of inertia of the telescope in kg-m^2, K_f is the proportionality constant relating friction and resisting torque in $\text{N-m/}(\text{rad/s})$ and ω is its angular position in radians.

$$\underbrace{\tau_m(t)}_{\substack{\text{motor}\\ \text{torque}}} - \underbrace{K_f \omega_T'(t)}_{\substack{\text{resisting torque}\\ \text{due to friction}}} = I\omega_T''(t) \Rightarrow \omega_T''(t) + \left(K_f / I\right)\omega'(t) = (1/I)\tau_m(t)$$

$$s^2\Omega_T(s) + s\left(K_f / I\right)\Omega_T(s) = (1/I)\mathrm{T}_m(s)$$

Let the transfer function relating applied dc voltage to torque for the motor be

$$\mathrm{H}_m(s) = \frac{K_\tau \omega_{cm}}{s + \omega_{cm}}$$

where K_τ is in N-m/V and ω_{cm} is the radian corner frequency of the motor's frequency response. The telescope transfer function, angular position in radians divided by torque in N-m is

$$\mathrm{H}_T(s) = \frac{\Omega_T(s)}{\mathrm{T}_m(s)} = \frac{1/I}{s\left(s + K_f / I\right)}$$

The forward-path transfer function of the unity-gain feedback system for positioning the telescope is

$$\mathrm{H}_1(s) = K_A\,\mathrm{H}_m(s)\mathrm{H}_T(s)K_\omega$$

where K_A is the voltage amplifier gain in V/V and K_ω is the proportionality constant relating telescope angular position to voltage of the position-measuring system in V/rad.

Overall system feedback transfer function.

$$\mathrm{H}(s) = \frac{\mathrm{H}_1(s)}{1 + \mathrm{H}_1(s)}$$

Let the initial position of the telescope be at zero radians and let the desired position be one radian. Then the forcing function is $\mathrm{v}_{set} = K_\omega \mathrm{u}(t)$ volts and $V_{set}(s) = K_\omega / s$. Simulate in MATLAB.